

Ryan Whitfield

From: Hannah Pool <Hannah.Pool@canalrivertrust.org.uk>
Sent: 21 October 2021 13:12
To: Ryan Whitfield
Subject: RE: Flood risk assessment for a proposed residential development bordering Ashton Canal, Manchester

Hi Ryan,

Thanks for your email.

I spoke to one of our Water Engineers regarding your questions, and have been informed that the nearest culvert to the site is Clayton Brook Culvert (AN-007-030). It appears to be opposite the end of Turner Street, so approximately 420m west of Crabtree Lane. However that is not to say there won't be unrecorded culverts we are unaware of so care will need to be taken when digging on site etc. and the developer might want to do their own utilities search if they haven't already.

It looks as though Lock 13 at Crabtree Lane has a by-wash culvert to pass water from the upstream pound to the downstream pound. This will need protecting from damage and, depending how close the works on site are and what they entail, we may ask for a pre and post construction survey of this culvert to ensure no damage has been sustained. Third party works would need to be involved at an early stage. It will be critical that we retain the ability to pass flows through this culvert at all times.

Looking on GIS and in SAP there are no reports of overtopping in the immediate vicinity. It's worth noting that as this is an active lock flight in an urban area it may be vulnerable to misuse and we may not be made aware of every overtopping incident.

I have also been informed by our Hydraulic/Hydrological Modeller that we do not have any breach analysis or modelled flood outlines for that section of canal.

Please let me know if you have any questions or require anything further.

Kind regards,
Hannah

Hannah Pool

BSc (Hons), MSc, GradCIWEM

Hydrometric Assistant

M 07919 691169

E hannah.pool@canalrivertrust.org.uk

Canal & River Trust

Canal Lane, Hatton, Warwick, CV35 7JL

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From: Ryan Whitfield <RWhitfield@rsk.co.uk>

Sent: 21 October 2021 12:16

To: Hannah Pool <Hannah.Pool@canalrivertrust.org.uk>

Subject: RE: Flood risk assessment for a proposed residential development bordering Ashton Canal, Manchester

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Hi Hannah,

Thanks for your email.

I wouldn't worry about providing flow data, I'm not sure what I could use it for in this instance.

Any other data would be great.

Kind regards,

Ryan Whitfield

Hydrologist BSc(Hons) MSc MCIWEM

RSK

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Registered number: 4723837

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From: Hannah Pool <Hannah.Pool@canalrivertrust.org.uk>

Sent: 21 October 2021 09:12

To: Ryan Whitfield <RWhitfield@rsk.co.uk>

Subject: Flood risk assessment for a proposed residential development bordering Ashton Canal, Manchester

Hello Ryan,

I received your flood risk assessment and am in the process of obtaining the information you requested.

Regarding your request for "**Information on canal water levels within close proximity of the site**" – we have a couple of sites within close proximity to the site that we hold some data for, but this is flow data (Ml/d) rather than canal level data. Would this be sufficient, and if so what frequency of data would you like (i.e. hourly, daily, monthly etc) and for what time period?

Many thanks,
Hannah

Hannah Pool

BSc (Hons), MSc, GradCIWEM

Hydrometric Assistant

M 07919 691169

E hannah.pool@canalrivertrust.org.uk

Canal & River Trust

Canal Lane, Hatton, Warwick, CV35 7JL

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Title: Mr

First name: Ryan

Last name: Whitfield

Email: rwhitfield@rsk.co.uk

Day telephone: 07932033683

Talk: Make a request for information under the FOIA or EIR

Message:

Good morning, I am writing a flood risk assessment for a proposed residential development which borders Ashton Canal, Manchester. I was checking if you are able to provide any available information which may assist in the assessment of canal flood risk to the site. Perhaps this could include; • Any recorded historic canal flood incidents in the area, • Information on canal water levels within close proximity of the site, • Any known culverted watercourses within the area, • Any modelled breach analysis or modelled flood outlines which may impact upon the site, Below if the site address. Site Address: Crabtree Lane, Manchester, M11 1BR 388702E , 398057N Many thanks, Ryan Whitfield.

Keep in touch

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Cadw mewn cysylltiad

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Mae'r e-bost hwn a'i atodiadau ar gyfer defnydd y derbynnydd bwriedig yn unig. Os nad chi yw derbynnydd bwriedig yr e-bost hwn a'i atodiadau, ni ddylech gymryd unrhyw gamau ar sail y cynnwys, ond yn hytrach dylech eu dileu heb eu copïo na'u hanfon ymlaen a rhoi gwybod i'r anfonwr eich bod wedi eu derbyn ar ddamwain. Mae unrhyw farn neu safbwynt a fynegir yn eiddo i'r awdur yn unig ac nid ydynt o reidrwydd yn cynrychioli barn a safbwyntiau Glandŵr Cymru.

Mae Glandŵr Cymru yn gwmni cyfyngedig drwy warant a gofrestrwyd yng Nghymru a Lloegr gyda rhif cwmni 7807276 a rhif elusen gofrestredig 1146792. Swyddfa gofrestredig: National Waterways Museum Ellesmere Port, South Pier Road, Ellesmere Port, Cheshire CH65 4FW.

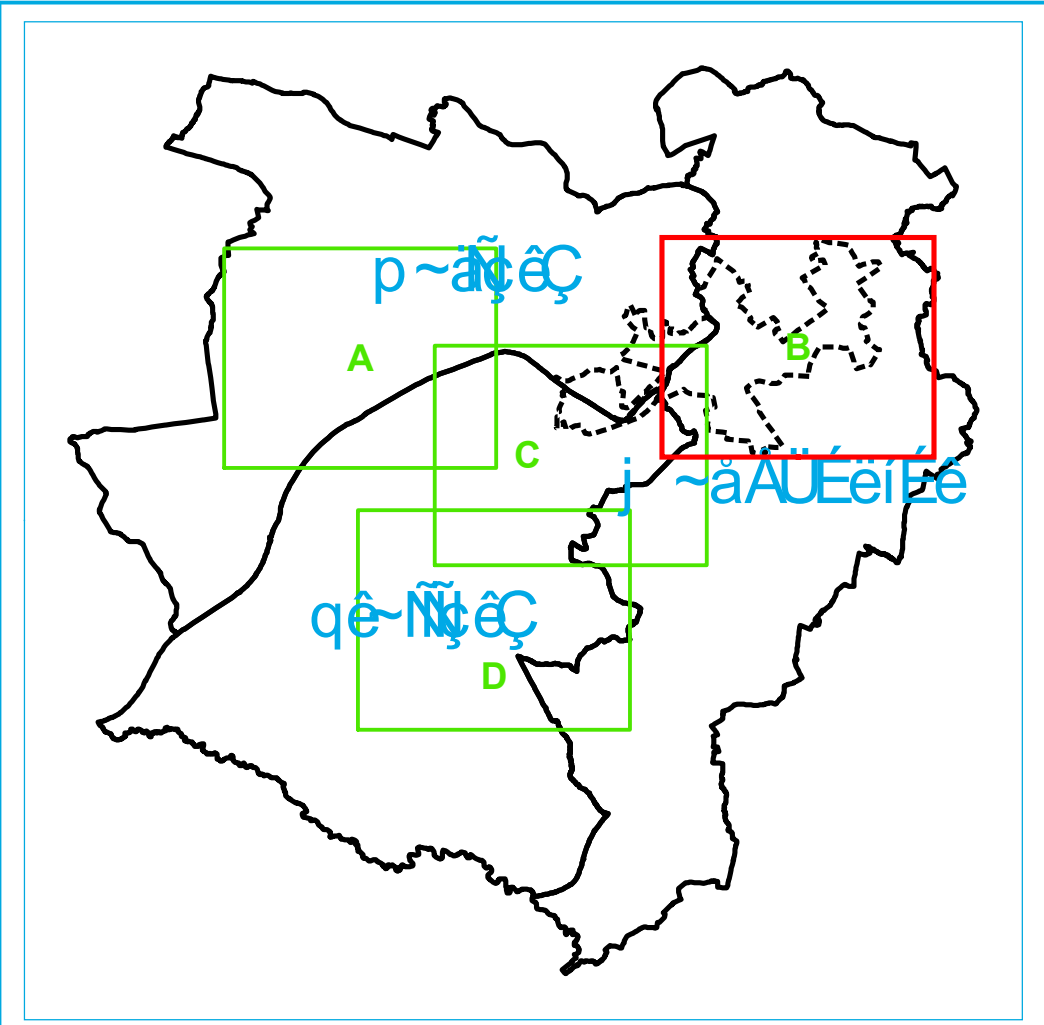
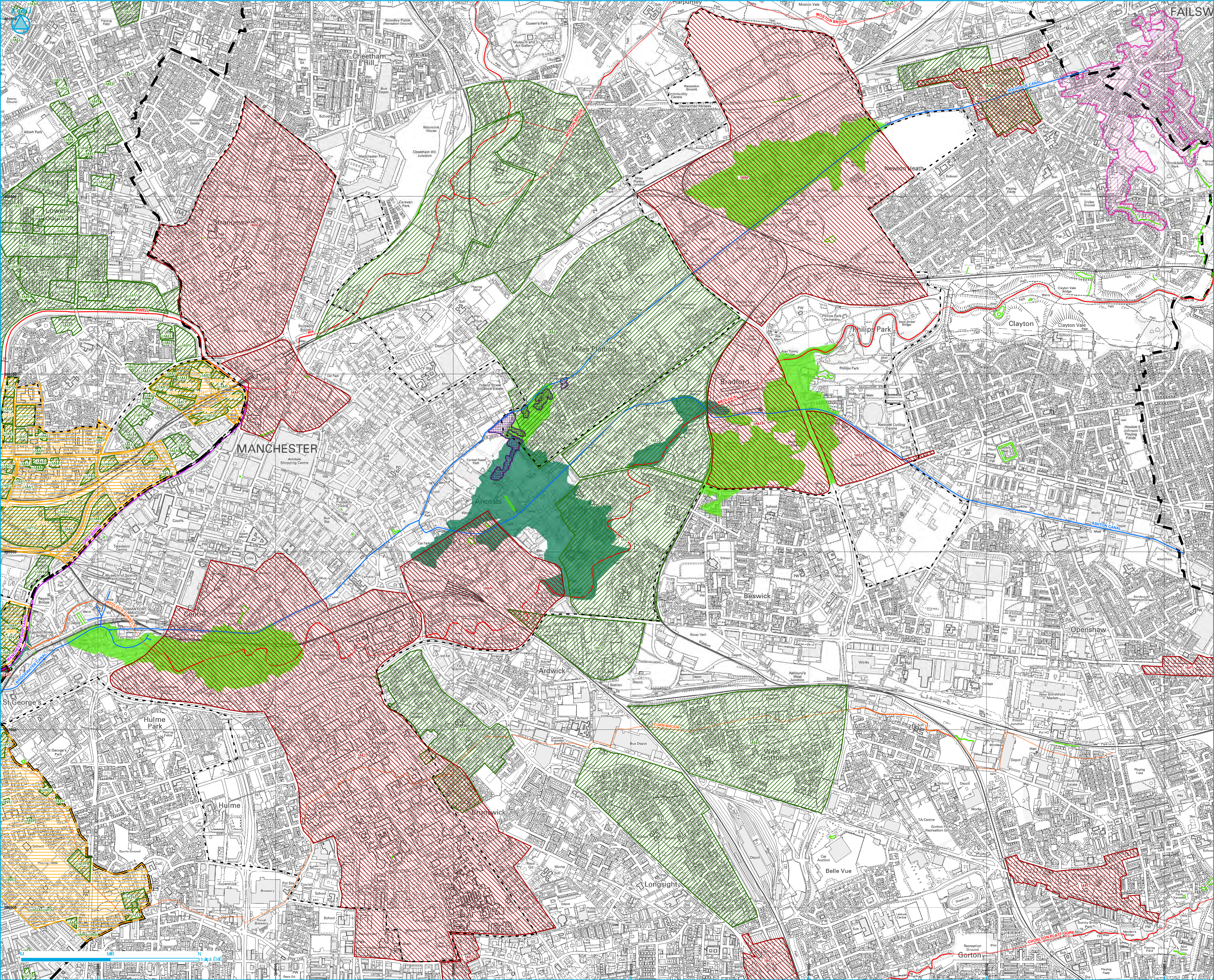
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APPENDIX J

SFRA CANAL FLOOD MAPPING



- Canal Overtop Hazard Zone
- Canal Breach Hazard Zone
- Potential Development Sites / Locations
- Main Rivers (V8.0)
- Digitised River Lines

It should be noted that these outlines are based on broadscale modelling techniques and should only be taken as an indication of areas that might be at risk and inform Flood Risk Assessments.

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JBA consulting

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Drawn by: g~e~U~E~U~s	Date: N~M~C~I~O~A~N	File Name: H~e~C~e~i~y~e~e~C~O~i~E~O~y~p~q~i~a~a~e~o~C~s~N~M~C~I~O~A~N
Checked by: g~e~U~E~U~s	Date: N~M~C~I~O~A~N	Status: c~f~k~^i
Approved by: g~e~U~E~U~s	Date: N~M~C~I~O~A~N	Scale: N~M~M~M~M



APPENDIX K

DRAINAGE STRATEGY

CIVIL / STRUCTURAL DESIGN RISK MANAGEMENT

Abnormal or unusual residual risks associated with the design outcomes shown on this drawing are:-

RSK LDE LTD has followed its Design Risk Management process for Hazard Elimination and Risk reduction in developing the designs shown on this drawing. Abnormal or unusual residual risks may be shown above where it is considered that such risk may not normally be expected by competent persons engaged on work of this nature or type.

Notes:

- This drawing is to be read in conjunction with all Architectural Drawings and Topographical Survey Drawing .
- This drawing has been prepared Appraisal purposes only, and a detailed design must be carried out prior to construction.
- Building levels are Finished Floor Levels (FFL's).
- Figures quoted next to manholes / rodding eyes are cover & invert level, in metres AOD.
- Footpaths are to be laid with a crossfall to allow drainage to soft landscaped areas.
- Where possible all drainage runs shall be kept a minimum of 4.0m from any existing tree that is to be retained.
- All drainage design is subject to technical approval, no connections shall be made to any public sewers without written consent from the drainage authority.

Legend:

- Development Boundary
- FFL 83.00 Proposed Finished Floor Level
- Proposed adoptable foul water sewer and manhole
- Proposed adoptable surface water sewer and manhole
- Existing Combined water sewer and manhole
- Porous Paving
- Private Storage

Drainage Statement - Foul Water

Foul water to drain by gravity to existing UU sewer.

Drainage Statement - Surface Water

- Surface water Network to drain into existing UU sewer at 20.5 l/s as per LLFA request
- No Surcharging in the 1 in 2 year event
- No flooding in 30 year event
- No flooding in 100 year +45% climate change event to be contained in offline storage
- Urban Creep 5% added to calculations.

Unit Reference MD-SHE-0155-1350-2300-1350
Design Head (m) 2.3 m
Design Flow (l/s) 13.5 l/s

Unit Reference MD-SHE-0100-7000-2800-7000
Design Head (m) 2.800
Design Flow (l/s) 7.0

Proposed Impermeable Area Plan

Existing Impermeable Area Plan

The details provided on this drawing are subject to comments by all the relevant approving authorities. Until such time as all comments have been received and incorporated onto the drawings, all the information provided and costings, are used at MCI risk and no liability will be accepted by RSK. Scheme based on MCI site plan ref Crabtree Lane - Proposed Site Layout Rev E

Prior to any construction, the contractor must confirm the precise invert level and pipe diameter of the receiving drainage system and must immediately advise RSK of any variation to that upon which the design has been based.

Rev.	Date	Amendment	Drawn	Chkd.	Appd.
P1	19.07.22	First issue			FJP

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Client
MCI Developments

Project Title
Crabtree Lane
Manchester

Status
Appraisal

Drawing Title
Drainage Feasibility

Drawn	Date	Checked	Date	Approved	Date
FJP	JULY 22				
Scale	NTS	Orig Size	A1	Dimensions	
Project No.	882621	Drawing File			
Drawing No.	10-01				Rev. P1



APPENDIX L

GREENFIELD RUNOFF RATES

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	919	919
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	6.64	6.64
1 in 1 year (l/s):	5.78	5.78
1 in 30 years (l/s):	11.29	11.29
1 in 100 year (l/s):	13.81	13.81
1 in 200 years (l/s):	15.73	15.73

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

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Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics

Default Edited

SOIL type:

HOST class:

SPR/SPRHOST:

Hydrological characteristics

Default Edited

SAAR (mm):

Hydrological region:

Growth curve factor 1 year:

Growth curve factor 30 years:

Growth curve factor 100 years:

Growth curve factor 200 years:

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

Default

Edited

Q_{BAR} (l/s):

1 in 1 year (l/s):

1 in 30 years (l/s):

1 in 100 year (l/s):

1 in 200 years (l/s):

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.



APPENDIX M

ATTENUATION CALCULATIONS

Frantech Engineering		Page 1
Flat B, 224 Prescott Road Saint Helens WS10 3HF		
Date 19/07/2022 10:59 File App P1.MDX	Designed by Frank Checked by	
Innovyze	Network 2019.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SNET1 P1

Pipe Sizes UU Manhole Sizes UU

FSR Rainfall Model - England and Wales

Return Period (years)	20	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.362	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	25	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	400

Designed with Level Soffits

Network Design Table for SNET1 P1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	27.217	0.068	400.3	0.123	5.00	0.0	0.600	o	1050	Pipe/Conduit	
1.001	23.442	0.059	397.3	0.054	0.00	0.0	0.600	o	1050	Pipe/Conduit	
2.000	33.050	0.083	398.2	0.114	5.00	0.0	0.600	o	1050	Pipe/Conduit	
2.001	17.897	0.045	397.7	0.088	0.00	0.0	0.600	o	1050	Pipe/Conduit	
1.002	35.784	0.090	397.6	0.088	0.00	0.0	0.600	o	1050	Pipe/Conduit	
1.003	26.895	0.067	401.4	0.071	0.00	0.0	0.600	o	1050	Pipe/Conduit	
3.000	31.306	0.078	401.4	0.074	5.00	0.0	0.600	o	1050	Pipe/Conduit	
3.001	21.310	0.053	402.1	0.076	0.00	0.0	0.600	o	1050	Pipe/Conduit	
1.004	26.876	0.067	401.1	0.056	0.00	0.0	0.600	o	1050	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	25.00	5.26	79.153	0.123	0.0	0.0	0.0	1.72	1486.2	8.3
1.001	25.00	5.49	79.085	0.177	0.0	0.0	0.0	1.72	1491.7	12.0
2.000	25.00	5.32	79.154	0.114	0.0	0.0	0.0	1.72	1490.0	7.7
2.001	25.00	5.49	79.071	0.201	0.0	0.0	0.0	1.72	1490.9	13.6
1.002	25.00	5.84	79.026	0.466	0.0	0.0	0.0	1.72	1491.1	31.6
1.003	25.00	6.10	78.937	0.537	0.0	0.0	0.0	1.71	1484.0	36.4
3.000	25.00	5.30	79.001	0.074	0.0	0.0	0.0	1.71	1484.1	5.0
3.001	25.00	5.51	78.923	0.151	0.0	0.0	0.0	1.71	1482.8	10.2
1.004	25.00	6.36	78.870	0.744	0.0	0.0	0.0	1.71	1484.5	50.4

Frantech Engineering		Page 2
Flat B, 224 Prescott Road Saint Helens WS10 3HF		
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Innovyze	Network 2019.1	

Network Design Table for SNET1 P1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
4.000	10.173	0.025	406.9	0.147	5.00	0.0	0.600	o	1050	Pipe/Conduit	
4.001	29.137	0.073	399.1	0.050	0.00	0.0	0.600	o	1050	Pipe/Conduit	
1.005	6.125	0.103	59.5	0.013	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
4.000	25.00	5.10	78.901	0.147	0.0	0.0	0.0	1.70	1473.8	9.9
4.001	25.00	5.38	78.876	0.197	0.0	0.0	0.0	1.72	1488.2	13.4
1.005	25.00	6.42	78.803	0.954	0.0	0.0	0.0	1.70	67.6	64.6

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Area Summary for SNET1 P1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.030	0.030	0.030
	User	-	100	0.044	0.044	0.074
	User	-	100	0.049	0.049	0.123
1.001	User	-	100	0.019	0.019	0.019
	User	-	100	0.030	0.030	0.050
	User	-	100	0.004	0.004	0.054
2.000	User	-	100	0.032	0.032	0.032
	User	-	100	0.052	0.052	0.084
	User	-	100	0.029	0.029	0.114
2.001	User	-	100	0.029	0.029	0.029
	User	-	100	0.023	0.023	0.051
	User	-	100	0.036	0.036	0.088
1.002	User	-	100	0.054	0.054	0.054
	User	-	100	0.034	0.034	0.088
1.003	User	-	100	0.024	0.024	0.024
	User	-	100	0.047	0.047	0.071
3.000	User	-	100	0.034	0.034	0.034
	User	-	100	0.017	0.017	0.051
	User	-	100	0.023	0.023	0.074
3.001	User	-	100	0.016	0.016	0.016
	User	-	100	0.035	0.035	0.051
	User	-	100	0.025	0.025	0.076
1.004	User	-	100	0.021	0.021	0.021
	User	-	100	0.012	0.012	0.033
	User	-	100	0.023	0.023	0.056
4.000	User	-	100	0.022	0.022	0.022
	User	-	100	0.055	0.055	0.077
	User	-	100	0.070	0.070	0.147
4.001	User	-	100	0.029	0.029	0.029
	User	-	100	0.022	0.022	0.050
1.005	User	-	100	0.013	0.013	0.013
				Total	Total	Total
				0.954	0.954	0.954

Free Flowing Outfall Details for SNET1 P1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
1.005	112	82.666	78.700	0.000	0	0

Frantech Engineering		Page 5
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Innovyze	Network 2019.1	

Online Controls for SNET1 P1

Hydro-Brake® Optimum Manhole: 111, DS/PN: 1.005, Volume (m³): 55.5

Unit Reference	MD-SHE-0155-1480-2300-1480
Design Head (m)	2.300
Design Flow (l/s)	14.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	155
Invert Level (m)	78.803
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	14.8
Flush-Flo™	0.674	14.8
Kick-Flo®	1.383	11.6
Mean Flow over Head Range	-	13.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.6	1.200	13.3	3.000	16.8	7.000	25.2
0.200	11.8	1.400	11.7	3.500	18.1	7.500	26.0
0.300	13.2	1.600	12.5	4.000	19.3	8.000	26.9
0.400	14.1	1.800	13.2	4.500	20.4	8.500	27.7
0.500	14.5	2.000	13.8	5.000	21.4	9.000	28.4
0.600	14.7	2.200	14.5	5.500	22.4	9.500	29.2
0.800	14.7	2.400	15.1	6.000	23.4		
1.000	14.3	2.600	15.7	6.500	24.3		

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Storage Structures for SNET1 P1

Cellular Storage Manhole: 101, DS/PN: 1.001

Invert Level (m) 80.300 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	70.0	0.0	0.801	0.0	0.0
0.800	70.0	0.0			

Cellular Storage Manhole: 103, DS/PN: 2.001

Invert Level (m) 80.300 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	70.0	0.0	0.801	0.0	0.0
0.800	70.0	0.0			

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SNET1 P1

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 2
 Number of Online Controls 1 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.351
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.200 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 45

PN	US/MH Name	US Label	US/CL (m)	Water Flooded		Maximum Vol (m ³)	Discharge Vol (m ³)	Pipe Flow (l/s)	Status
				Level (m)	Volume (m ³)				
1.000	100		82.703	81.905	0.000	6.991	79.610	13.4	SURCHARGED
1.001	101		82.611	81.905	0.000	82.395	95.389	39.9	SURCHARGED
2.000	102		82.644	81.905	0.000	6.988	73.286	12.2	SURCHARGED
2.001	103		82.383	81.905	0.000	87.481	106.833	38.0	SURCHARGED
1.002	104		82.372	81.905	0.000	39.992	229.410	61.0	SURCHARGED
1.003	105		82.444	81.905	0.000	36.970	246.535	48.4	SURCHARGED
3.000	106		81.941	81.905	0.000	7.376	46.699	16.7	FLOOD RISK
3.001	107		82.466	81.905	0.000	33.124	70.813	31.5	SURCHARGED
1.004	108		82.561	81.905	0.000	46.333	314.423	31.2	SURCHARGED
4.000	109		82.546	81.904	0.000	7.629	94.634	25.3	SURCHARGED
4.001	110		82.354	81.904	0.000	14.943	118.307	37.0	SURCHARGED
1.005	111		82.768	81.904	0.000	53.263	393.506	17.1	SURCHARGED

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SNET2 P1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales			
Return Period (years)	20	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.357	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	250	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	400

Designed with Level Soffits

Network Design Table for SNET2 P1

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	18.942	0.047	403.0	0.068	5.00	0.0	0.600	o	1050	Pipe/Conduit	
S2.000	12.703	0.032	397.0	0.045	5.00	0.0	0.600	o	1050	Pipe/Conduit	
S1.001	15.532	0.039	398.3	0.039	0.00	0.0	0.600	o	1050	Pipe/Conduit	
S1.002	7.594	0.019	399.7	0.024	0.00	0.0	0.600	o	1050	Pipe/Conduit	
S1.003	20.933	0.052	402.6	0.029	0.00	0.0	0.600	o	1050	Pipe/Conduit	
S1.004	4.908	0.076	64.6	0.019	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	99.21	5.18	78.946	0.068	0.0	0.0	0.0	1.71	1481.0	18.4
S2.000	99.67	5.12	78.931	0.045	0.0	0.0	0.0	1.72	1492.3	12.2
S1.001	98.10	5.34	78.899	0.152	0.0	0.0	0.0	1.72	1489.9	40.4
S1.002	97.57	5.41	78.860	0.176	0.0	0.0	0.0	1.72	1487.2	46.6
S1.003	96.14	5.61	78.841	0.205	0.0	0.0	0.0	1.71	1481.9	53.5
S1.004	95.70	5.68	78.789	0.224	0.0	0.0	0.0	1.25	22.1«	58.1

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Area Summary for SNET2 P1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.037	0.037	0.037
	User	-	100	0.031	0.031	0.068
2.000	User	-	100	0.045	0.045	0.045
1.001	User	-	100	0.014	0.014	0.014
	User	-	100	0.025	0.025	0.039
1.002	User	-	100	0.006	0.006	0.006
	User	-	100	0.019	0.019	0.024
1.003	User	-	100	0.021	0.021	0.021
	User	-	100	0.008	0.008	0.029
1.004	User	-	100	0.007	0.007	0.007
	User	-	100	0.011	0.011	0.019
				Total	Total	Total
				0.224	0.224	0.224

Free Flowing Outfall Details for SNET2 P1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
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S1.004	S206	82.665	78.713	0.000	0	0
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Simulation Criteria for SNET2 P1

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	20	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.362		

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Online Controls for SNET2 P1

Hydro-Brake® Optimum Manhole: S205, DS/PN: S1.004, Volume (m³): 27.4

Unit Reference	MD-SHE-0100-7400-3200-7400
Design Head (m)	3.200
Design Flow (l/s)	7.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	100
Invert Level (m)	78.789
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	3.200	7.4
Flush-Flo™	0.440	5.1
Kick-Flo®	0.896	4.1
Mean Flow over Head Range	-	5.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	4.7	3.000	7.2	7.000	10.7
0.200	4.6	1.400	5.0	3.500	7.7	7.500	11.1
0.300	5.0	1.600	5.3	4.000	8.2	8.000	11.4
0.400	5.1	1.800	5.6	4.500	8.7	8.500	11.8
0.500	5.1	2.000	5.9	5.000	9.1	9.000	12.1
0.600	5.0	2.200	6.2	5.500	9.6	9.500	12.4
0.800	4.6	2.400	6.5	6.000	10.0		
1.000	4.3	2.600	6.7	6.500	10.3		

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<u>2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for SNET2 P1</u>				
<u>Simulation Criteria</u>				
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000				
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000				
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800				
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000				
Foul Sewage per hectare (l/s) 0.000				
Number of Input Hydrographs 0 Number of Storage Structures 0				
Number of Online Controls 1 Number of Time/Area Diagrams 0				
Number of Offline Controls 0 Number of Real Time Controls 0				
<u>Synthetic Rainfall Details</u>				
Rainfall Model FSR Ratio R 0.351				
Region England and Wales Cv (Summer) 0.750				
M5-60 (mm) 18.200 Cv (Winter) 0.840				
Margin for Flood Risk Warning (mm) 300.0				
Analysis Timestep 2.5 Second Increment (Extended)				
DTS Status ON				
DVD Status ON				
Inertia Status ON				
Profile(s) Summer and Winter				
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440				
Return Period(s) (years) 2, 30, 100				
Climate Change (%) 0, 0, 45				

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for SNET2 P1

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
 Number of Online Controls 1 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.351
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.200 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 45

PN	US/MH Name	US Label	US/CL (m)	Water Flooded		Maximum Vol (m ³)	Discharge Vol (m ³)	Pipe	Status
				Level (m)	Volume (m ³)			Flow (l/s)	
S1.000	S200		82.169	79.448	0.000	1.484	15.067	9.6	OK
S2.000	S201		81.681	79.448	0.000	1.529	9.583	5.9	OK
S1.001	S202		81.909	79.448	0.000	11.172	28.644	11.1	OK
S1.002	S203		81.767	79.448	0.000	6.957	30.729	9.1	OK
S1.003	S204		81.903	79.448	0.000	4.075	35.155	10.5	OK
S1.004	S205		82.445	79.447	0.000	10.631	33.556	5.1	SURCHARGED

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SNET2 P1

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
 Number of Online Controls 1 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.351
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.200 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 45

PN	US/MH Name	US Label	US/CL (m)	Water Flooded		Maximum Vol (m ³)	Discharge Vol (m ³)	Pipe Flow (l/s)	Status
				Level (m)	Volume (m ³)				
S1.000	S200		82.169	80.605	0.000	4.939	35.406	11.6	SURCHARGED
S2.000	S201		81.681	80.605	0.000	4.984	22.538	7.2	SURCHARGED
S1.001	S202		81.909	80.605	0.000	29.104	60.414	12.1	SURCHARGED
S1.002	S203		81.767	80.605	0.000	16.957	62.679	9.3	SURCHARGED
S1.003	S204		81.903	80.605	0.000	10.140	72.405	10.9	SURCHARGED
S1.004	S205		82.445	80.605	0.000	21.846	66.846	5.7	SURCHARGED